



# 2016

## Survey Technical Workshop

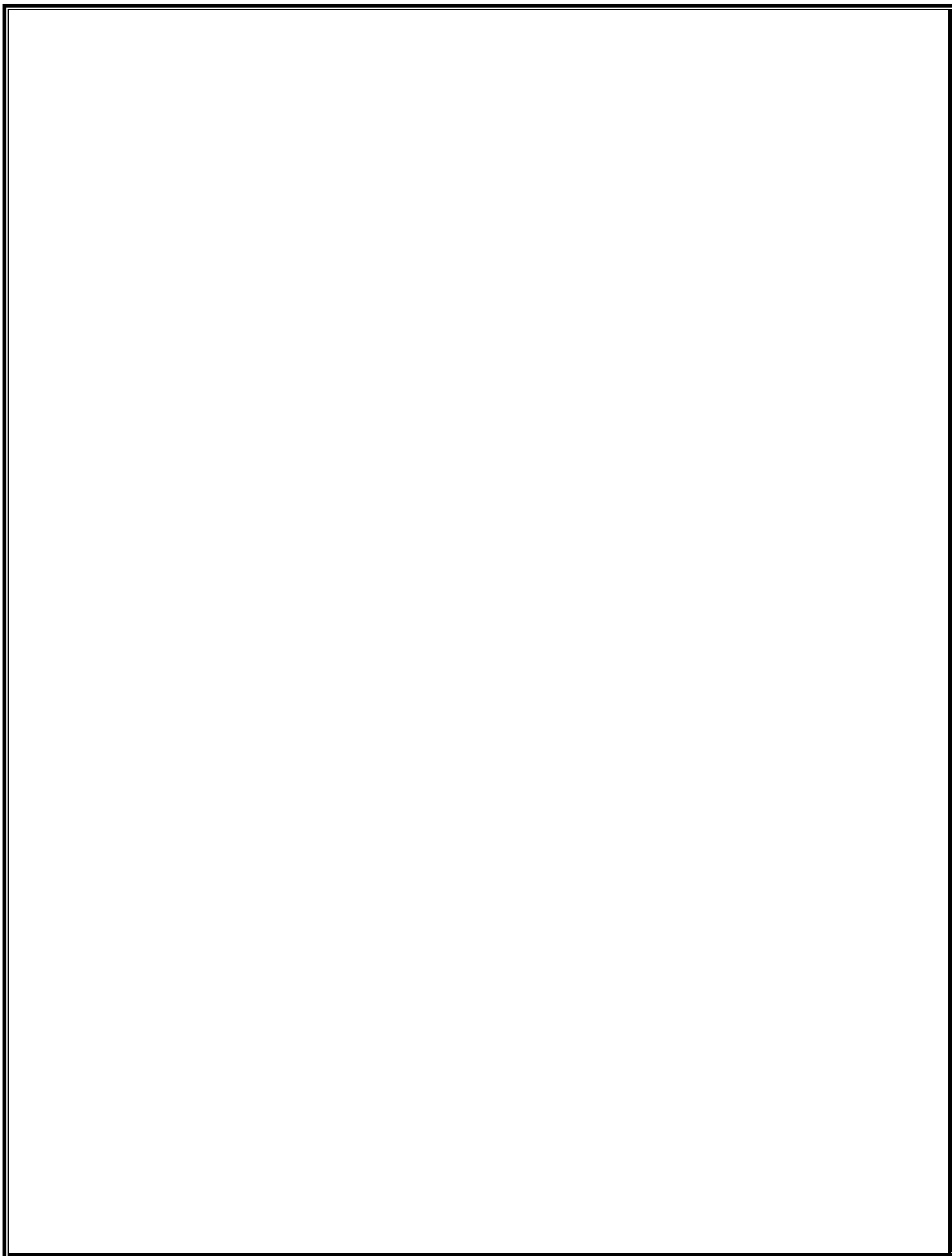
### March 15 – 17

## 19th Annual Workshop



Sponsored by the Office  
of Land Management





# Welcome to the 19<sup>th</sup> Annual Survey Technical Workshop

March 15 – 17, 2016



**Sponsored by: The Office of Land Management  
Minnesota Department of Transportation**

Director, Office of Land Management..... Bryan J. Dodds  
Assistant Director, Survey & Mapping ..... Richard Morey  
Workshop/Training Coordinator..... Cheryl Hunstock  
Workshop Technical Support ..... Blaine McKeever (MN.IT)

## **Workshop Planning Committee:**

Nathan Anderson ..... MnDOT (St. Paul)  
Brad Canaday ..... MnDOT (Metro)  
David Clark..... MnDOT (Duluth)  
Casey Crisp..... MnDOT (Metro)  
Jeremy Erickson..... MnDOT (Detroit Lakes)  
Jeremy Flatau ..... MnDOT (Detroit Lakes)  
Lance Frost ..... Stonebrooke Eng., Inc.  
Joe Hamlin ..... MnDOT (Metro)  
Lisa Hanni ..... Goodhue County  
Cheryl Hunstock..... MnDOT (St. Paul)  
Pete Jenkins..... MnDOT (St. Paul)  
Steve Jobe ..... Wright County  
Bud Jorgenson ..... MnDOT (St. Paul)  
Richard Morey ..... MnDOT (St. Paul)  
James Schneider..... MnDOT (Metro)  
Kevin Sutherland..... MnDOT (Duluth)  
Chris Terwedo..... Ramsey County

## FROM THE WORKSHOP COMMITTEE

The Minnesota Department of Transportation welcomes you to the 2016 Survey Technical Workshop. This event marks the 19<sup>th</sup> consecutive year that the Office of Land Management is the sponsor of this workshop. We want to acknowledge the contributions of our public and private sector partners who continue to help us make this workshop a success year after year.

This workshop allows all interested parties the opportunity to review current practices, examine prospective trends, consider technical improvements and build relationships within the surveying community.

The workshop committee is comprised of county, private sector and MnDOT employees and has worked hard to compile session topics that are hopefully pertinent and interesting to those involved in survey operations throughout the State of Minnesota. The committee diligently reviewed last year's evaluation forms and made every attempt to improve the workshop based on the comments and suggestions made by the attendees. That being said, please remember to fill out the evaluation form in the packet of information you received at the time of registration. It is closely reviewed and helpful when planning future workshops. We encourage you to fill it out as you complete each session. That way it won't be such a daunting task to complete at the end of the workshop. Please feel free to contact anyone on the workshop committee with comments or suggestions regarding the workshop. The names of the committee members are at the beginning of this booklet.

The workshop sessions have been arranged in both plenary and concurrent formats and include some repeated sessions. Please take a few minutes to review the schedule, session descriptions, speaker biographies and vendor summaries in this booklet as they will assist you in determining what sessions you may like to attend to maximize your learning experience.

If during the workshop you want to take some time to speak more privately with a vendor in the display area in the Lakeside Dining Room, please do so. While we encourage attendance at all the sessions we realize this may be the best time for you to ask questions of the vendors.

For those of you submitting for Professional Development Hours with the *Board of Architecture, Engineering, Land Surveying, Landscaping Architecture, Geoscience and Interior Design*, please select those sessions that will meet your personal training needs and satisfy your defined licensing standard requirements. Workshop participants are responsible for submitting for Professional Development Hours with the board.

We would like to thank the presenters for generously sharing their time and knowledge and for providing us all the opportunity to learn and ultimately improve the services we provide. Last, but not least, special thanks go to you, the participant. This workshop would not exist without your continued support and enthusiasm. We encourage your participation in each of the sessions. The evening will provide you with a more casual environment to consider and discuss the day's materials and events.

Again, welcome! We hope you enjoy the workshop.

# FOR YOUR INFORMATION:

In the packet you received at registration you will find:

- **Workshop Program** – This booklet contains the schedule, session descriptions, presenter and vendor biographies.
- **Quick Reference Guide** – This is for your convenience in finding sessions of interest.
- **Evaluation Form** – This form **MUST** be turned in at the end of the workshop. These evaluations are essential as we consider pertinent topics for future workshops. They also give us vital information about how certain topics were received and about the workshop presentations in general.
- **Name Tag** – Please wear this name tag throughout the workshop. Not only do we want to know who you are, but your name tag will identify your company and/or place of employment. Please return name tags at the end of the workshop located on the registration table for your convenience.
- **Tuesday, March 15 Lunch Ticket** – If you have purchased Cragun's Lodging Package or the Meeting/Meal Package, you will find the March 15 lunch ticket affixed in your workshop packet. This was done in an effort to avoid confusion at the first lunch of the workshop. The remainder of your meal tickets can be picked up at Cragun's registration desk in the main lobby upon check-in. If you have purchased the meeting/meal package only, your tickets can also be picked up at Cragun's registration desk.

***THANK YOU  
FOR SUPPORTING  
MnDOT'S 2016 SURVEY  
TECHNICAL WORKSHOP***



# 2016 SURVEY TECHNICAL WORKSHOP SCHEDULE

**TUESDAY, MARCH 15, 2016**

**CENTRE**

9:00 AM	<b>WORKSHOP REGISTRATION</b>			
10:00 AM	<b>WELCOME &amp; OPENING REMARKS</b> <b>Rick Morey, Assistant Director</b> Office Of Land Management			
10:15 AM	<i><b>Surveying in Antarctica</b></i> Cole Kelleher			
11:15 AM	<i><b>The Rectangular Public Land Surveys in Minnesota</b></i> Rod Squires			
12:15 PM	<b>LUNCH IN LAKESIDE DINING ROOM</b>			
	<b>LAKESHORE 1 &amp; 2</b>	<b>LAKESHORE 3 &amp; 4</b>	<b>PAUL BUNYAN 1 &amp; 2</b>	<b>PAUL BUNYAN 3 &amp; 4</b>
1:15 PM	<i><b>Point Cloud Deliverables From Photogrammetry &amp; Imaging</b></i> Steve Richter	<i><b>Creating a 3D Corridor Utilizing Geopak and Trimble Business Center</b></i> Jeremy Erickson Chuck Vizenor	<i><b>Retro-Reflecting Prism Errors</b></i> David Zenk REPEATED 3/17 AT 9am	<i><b>TopoDOT GIS Asset ID &amp; Extraction from LiDAR Data</b></i> Ted Knaak
2:15 PM	<i><b>The Evolution of the 5TH PM Grid System (1815-2016)</b></i> Don Borcharding	<i><b>Intelligent Compaction and Machine Guided Excavation</b></i> Rebecca Embacher	<i><b>Leica Captivate (Part 1)</b></i> Tim Kerr	
3:15 PM	<b>BREAK IN LAKESIDE DINING ROOM</b>			
3:30 PM	<i><b>An Introduction to Geodesy, Datums and Coordinate Systems</b></i> Geoff Bitner REPEATED 3/16 AT 9:00am	<i><b>Surveying the Cannon Valley Trail</b></i> Dale Lemke	<i><b>Leica Captivate (Part 2)</b></i> Tim Kerr	
4:30 PM	<b>ADJOURN</b>			
5:30 PM	<b>DINNER IN LAKESIDE DINING ROOM</b>			



VENDOR DEMONSTRATIONS



TYPICAL (ABBREVIATED) MnDOT SURVEY SCHOOL TOPICS





# 2016 SURVEY TECHNICAL WORKSHOP SCHEDULE

**WEDNESDAY, MARCH 16, 2016**

6:45 am	BREAKFAST IN LAKESIDE DINING ROOM		
	LAKESHORE 1 & 2	LAKESHORE 3 & 4	PAUL BUNYAN 1 & 2
8:00 am	<b>Land Corner Research (Urban Perspective)</b> Bill Brown	<b>Machine Control Modeling &amp; Today's Construction Staking</b> Kyle Klasen	<b>Bentley Survey Work in 3D</b> Bob Rolle
9:00 am	<b>An Insider's Look at COGO &amp; Functions Within Trimble Access</b> Wes Schneider REPEATED 3/17 AT 8:00AM	<b>3D Design and Case Study: Snelling Ave. Project</b> Brad Canaday	<b>An Introduction to Geodesy, Datums and Coordinate Systems</b> Geoff Bitner REPEAT
10:00 am	BREAK IN LAKESIDE DINING ROOM		
10:15 am	<b>Archiving Legacy Survey Records</b> Preston Dowell	<b>Agriculture Technologies</b> Todd Hesse	<b>A Study of Elevational Accuracy of On-Line Terrain Data Sources</b> Ladd Nelson
11:15 am	<b>Professional Ethics: A Facilitated Discussion</b> Rick Morey	<b>Point Clouds: Being Laser Scanned Data Into Civil 3D</b> Scott Mizsak REPEATED 3/17 at 9am	<b>Land Corner Research (Rural Perspective)</b> Robin Mathews
12:15 pm	LUNCH IN LAKESIDE DINING ROOM		
1:15 pm	<b>Unmanned Aircraft System (UAS)</b> Jay Haskamp	<b>Mobile LiDAR Case Study</b> Nathan Anderson Adam Smith	<b>TopoDOT for Transportation Corridor Topography Extraction from Mobile LiDAR Data</b> Ted Knaak
2:15 pm	<b>What Does It Take To Fly A Drone Commercially and Generate High Accuracy Deliverables</b> Jeffrey J. Walsh Steven N. Zeets	<b>MnDOT Geodetic &amp; Photogrammetric Survey Products</b> Mar Alojado Colin Lee Benard Obwocha	<b>Mobile LiDAR for Multiple Applications: Drive Once Read Many</b> Craig Gooding
3:15 pm	BREAK IN LAKESIDE DINING ROOM		
3:30 pm	<b>Wisconsin/Minnesota State Line</b> Brian Meyer	<b>Loon Satellite Tracking</b> Carrol Henderson	<b>Trimble Tablet Functionality</b> Jay Haskamp Wes Schneider
4:30 pm	ADJOURN		
5:30 pm	DINNER IN LAKESIDE DINING ROOM		



# 2016 SURVEY TECHNICAL WORKSHOP SCHEDULE

**THURSDAY, MARCH 17, 2016**

6:45 am				BREAKFAST IN LAKESIDE DINING ROOM			
8:00 AM	LAKESHORE 1 & 2		LAKESHORE 3 & 4		PAUL BUNYAN 1 & 2		
	<i>Tree Identification Topic: "Original" Bearing and Line Trees</i> David Hanson		<i>Traffic Safety: Working in the Right of Way</i> Kathleen Schaefer		<i>An Insider's Look at COGO &amp; Functions Within Trimble Access</i> Wes Schneider		
					REPEAT		
9:00 AM	<i>Point Clouds: Being Laser Scanned Data Into Civil 3D</i> Scott Mizzak		<i>How the !!!???!!! Did That Happen?</i> John McClellan		<i>Retro-Reflecting Prism Errors</i> David Zenk		
	REPEAT				REPEAT		
10:00 AM				BREAK IN THE CENTRE			
10:15 AM	CENTRE						
	<i>See Tracks, Think Train!</i> Sheryl Cummings						
11:15 AM	<i>St. Croix River Crossing Project</i> Michael Beer						
12:15 PM				ADJOURN			



VENDOR DEMONSTRATIONS



TYPICAL (ABBREVIATED) MnDOT SURVEY SCHOOL TOPICS





# 2015 SURVEY TECHNICAL WORKSHOP

## March 17 – 19

### Session Descriptions and Speaker Biographies

#### **WELCOME AND OPENING REMARKS**

##### **Bryan J. Dodds – Director, MnDOT Office of Land Management**

Mr. Dodds is the Director of MnDOT's Office of Land Management, a statewide role managing Real Estate, Utility Agreements and Permits, Surveying and Mapping and Photogrammetry. He graduated from the University of Minnesota with a degree in Civil Engineering and is a Professional Engineer. Mr. Dodds' career with the Minnesota Department of Transportation began as a Graduate Engineer Trainee with rotations in District 2, Bemidji and Central Office, St. Paul. He has worked as Project Manager in Metro District's Office of State Aid working on Cooperative Agreement and Federal Aid projects; Project Manager on the design and construction of the Northstar Corridor Rail Project; and the Director of the Metro District Transit Section responsible for managing MnDOT's role in planning, designing, constructing, and operating major transit projects in the Metro area.



##### **Richard Morey – Assistant Director, MnDOT Office of Land Management**

Richard Morey is a 36 year veteran of the MnDOT surveying community. Starting as a Highway Technician on a construction survey crew, Rick has progressed through the positions of Survey Crew Chief to District Surveyor, to his current position as Assistant Director in charge of the Office of Land Management Surveying and Mapping Section. Rick is a member of MSPS, being selected as the 2009 Surveyor of the Year. He also holds a Masters of Geographic Information Science from the University of Minnesota where he has served as an adjunct professor.

The Minnesota Department of Transportation, specifically the Office of Land Management, would like to honor Rick for his 36 years of service to the State of MN. Rick has been a pioneer in the surveying community statewide and he will be missed. Thank you Rick, for your many years of service to the people of Minnesota. We'll miss you and wish you all the best for a very long and happy retirement!

## **OPENING SESSION:**

### **Surveying in Antarctica**

Presented by Cole Kelleher

While exploration and mapping in the Antarctic dates back over a century, it has only been in the past few decades that enormous developments have been made. These developments are in large part due to the advances in geospatial and remote sensing technologies which allow us to capture, derive, and distribute the most detailed and accurate data sets of the Polar Regions the world has ever seen. Much of this data is not only providing new capabilities for science and logistics personnel but increasing the efficiency of operations and decreasing the overall impact of mankind's presence in the Antarctic. However, there are many issues that come with collecting accurate geospatial data in one of the most remote places on Earth. In this presentation I will discuss new spatial technologies that are now being employed to map and explore Antarctica both in the field and remotely, as well as the hurdles that are present when mapping the unique landscapes of the world's coldest continent.

#### **Cole Kelleher – University of Minnesota Polar Geospatial Center**

Mr. Kelleher received his Bachelor's Degree in Land Surveying and Mapping from St. Cloud State University and continued his education at the University of Minnesota where he received a Master's Degree in Geographic Information Science. Today, he holds the position of Support Coordinator at the University of Minnesota's Polar Geospatial Center. Having made five consecutive deployments to Antarctica, Mr. Kelleher provides on-site mapping support to scientists, logistics teams and contract personnel. Through these experiences he has gained a unique perspective on the challenges in conducting science, mapping, and protecting the most inhospitable continent on Earth.

*The workshop sessions that follow are listed in this program in alphabetical order for quick reference*

### **3D Design and Case Study: Snelling Ave. Project**

Presented by Brad Canaday

During this session, you will learn how 3D utility location and 3D design could have shown utility conflicts with proposed construction prior to the job being built and in addition show the corrections made in the field to resolve the conflicts.

#### **Brad Canaday – Minnesota Department of Transportation**

Mr. Canaday is the Metro Surveys Manager for MnDOT. He has over 42 years of surveying experience as a licensed Land Surveyor in both Minnesota and Wisconsin. As a Survey Manager, Mr. Canaday manages the personnel, budget and equipment for all survey activities in the Twin Cities Metro area.

### **A Study of Elevation Accuracy of On-Line Terrain Data Source**

Presented by Ladd Nelson

As the on-line availability of digital terrain data continues to increase, land development firms can utilize this information to aid in preliminary design and cost scenarios. In this

session, we will explore surface model creation from a variety of on-line sources and compare the accuracy of these data sets with traditional elevation data gathered with GNSS receivers.

**Ladd Nelson – Carlson Software, Inc.**

Mr. Nelson is currently the Director of Midwest Sales for Carlson Software—a leading provider of land surveying, engineering and construction-related hardware and software technology products. His past work experience has included land surveying responsibilities and this knowledge, coupled with his interest in computers and Civil Engineering Degree from the University of Wisconsin-Platteville gave him the opportunity to pursue a career in software development for land surveyors and civil engineers. For over twenty years, Mr. Nelson has been providing his clients with technical support and on-site training and in 2007, added sales service to his repertoire when he joined Carlson Software. Beginning in 2011, he was also elected to serve on the Board of Directors of the IntelliCAD Technology Consortium, a non-profit organization that develops software technology code products for the CAD markets and continues to serve an Officer role in the ITC to this day.

**Agriculture Technologies**

Presented by Todd Hesse

Technology in Agriculture has evolved! GPS, sensors, UAV's, Data and more play a key role in production agriculture. In this session we will discuss what Agriculture technology was, is and will be in the years to come.

**Todd Hesse – Ziegler, Inc.**

Mr. Hesse grew up on a small family farm near Comfrey, MN where his family still farms. Upon graduating from Southwest Minnesota State University with a major in Agribusiness and Minor in Agronomy, he worked his first job as an agronomist at Farmers Cooperative of Hanska near New Ulm, MN. This is where Mr. Hesse first learned of Precision Ag and its many uses. From there he went on to work for AGCO Corporation out of Minnetonka, MN in their Precision Agriculture division known as GTA, or Global Technologies for Agriculture. Here Mr. Hesse was responsible for managing and supporting desktop software that agronomists would use to make GPS Variable Rate Prescriptions of crop inputs. This is also where he was first introduced to Auto Steer and Yield Monitoring technologies. In 2007 Mr. Hesse went to work for Ziegler Cat in Shakopee, MN where he currently works as a Product Manager for Agriculture Technologies. In his current role, Mr. Hesse is responsible for monitoring the Precision Ag industry and helping guide Ziegler in the products and services they offer to their grower and retail customers.

**An Insider's Look at COGO & Functions Within Trimble Access**

Presented by Wes Schneider

During this session there will be time spent on the most widely used COGO functions, including the features and functions found when selecting the right arrow button within Access. We will cover common methods for editing data such as:

- Why and when would I select FastFix?
- What does "Find" do for me?
- How do I change a large number of incorrect rod heights?
- What is the easiest/ best way to create a volume on the Tablet?

**Wes Schneider – Frontier Precision, Inc.**

Mr. Schneider joined Frontier Precision in 1994 as he was going to College for Business. He moved to the St. Cloud Minnesota office in 2001 to take over the Northern Minnesota territory. Currently, Mr. Schneider still covers the North and West territories of Minnesota as a Geospatial Solution Expert working out of the St. Cloud office for Frontier. With over 17 years of Survey Industry experience, he brings a strong knowledge of providing technical consultation to fit into every survey application.

**An Introduction to Geodesy, Datums and Coordinate Systems**

Presented by Geoff Bitner

Geodesy, datums and coordinate systems define our daily work. References to them can be found in equipment settings, software options, construction plans and reports; to name just a few. In addition, surveyors are often called upon to help resolve issues associated with spatial references. For that reason, it is important that we understand the fundamental elements that distinguish each one and relate them together. Some of the topics covered in this session will be ellipsoids, geoids, datums (WGS84, NAD83, NAVD88) and coordinate systems such as State Plane, UTM and Minnesota County. At the end of this presentation you should have a better understanding of geodesy, datums and coordinate systems that they will be able to apply to their daily activities. In addition, you will learn where to find more detailed information about each topic for your professional development.

**Geoff Bitner – Minnesota Department of Transportation**

Mr. Bitner is a licensed Land Surveyor with the Minnesota Department of Transportation's Office of Land Management, Geodetic Unit. He joined MnDOT in 1998 as a Survey Technician with the Metro District and since 2011 he has been working as a Geodetic Surveyor. During that time, Mr. Bitner has bluebooked more than 80 GNSS projects following NGS and FGDC standards. He holds a Bachelor of Science Degree from Salisbury University in Maryland and a Master of Science Degree from the University of Minnesota.

**Archiving Legacy Survey Records**

Presented by Preston Dowell

As survey records age, the condition deteriorates, but the importance does not. During this session we will explore options and techniques for archiving survey records while ensuring they are accessible for daily use.

**Preston Dowell – St. Louis County**

Mr. Dowell is a Deputy Land Surveyor with St. Louis County, Minnesota. His dedication to the Land Surveying industry combined with a proficiency in GIS, CAD and database technology has allowed him to develop new techniques for accessing survey records.

**Bentley Survey Work in 3D**

Presented by Bob Rolle

During this session you will learn what it is like to not have to start from a blank canvas with fully-3D representations from digital photographs. We will explore processing observations of existing conditions into representations for contextual alignment within design modeling and construction modeling environments. Finally, we will discuss using the reality as context whether you are designing, building or operating something.

**Bob Rolle, P.E. – Bentley Systems Inc.**

Mr. Rolle is a registered professional engineer in the state of Kansas. He worked for several years for the Kansas Department of Transportation as a project engineer. In 1992 Mr. Rolle began working for a consultant firm as a Project Design Engineer and later was assigned as the Design Support Systems Engineer position focusing on providing Civil resources, support and training for the corporation. Mr. Rolle has worked for Bentley Systems for the last 5 years as a Civil Application Engineer for the Global Pre-Sales Team and is based out of Kansas City.

**Creating a 3D Corridor Utilizing Geopak and Trimble Business Center**

Presented by Jeremy Erickson and Chuck Vizenor

During this session there will be a demonstration of how to export alignments, profiles and cross sections from Geopak and then import those elements into Trimble Business Center where we will create a 3D corridor for use during construction staking. There will also be a demonstration of the various corridor tools in TBC as part of this process.

**Jeremy Erickson – Minnesota Department of Transportation**

Mr. Erickson is a Senior Land Surveyor with MnDOT in District 4, Detroit Lakes. He began his career with MnDOT as a summer laborer in 1991 and was hired full time in 1995 after graduating from North Dakota State University (“Go Bison”) with a Bachelor of Science Degree in Civil Engineering. Since then he has worked in MnDOT’s Metro District at the Golden Valley office (’95-96), Geodetics (’96-98) and Fergus Falls (’98 to Present).

**Chuck Vizenor – Minnesota Department of Transportation**

Mr. Vizenor has worked for MnDOT District 4 in Detroit Lakes since 1998. He began working in Surveys in 1999 and has been leading crews in the field since 2002. Mr. Vizenor was promoted to a Transportation Specialist in 2008. As of March 9<sup>th</sup>, 2016, he transferred to District 1, Duluth. Mr. Vizenor has worked extensively with 3D corridors in construction staking, using both Trimble Geomatics Office and Trimble Business Center in the office as well as various field data collectors.

**How The !!!??!!! Did That Happen?**

Presented by John McClellan

Every day, dispatchers at the MnDOT’s RTMC (Regional Traffic Management Safety Center) respond to dozens of crashes and other incidents on the Metro freeway system. During this session you will view examples of common crash causes recorded from MnDOT’s traffic cameras along with suggestions for awareness both in the work zone and in regular driving.

**John McClellan – MnDOT’s Regional Traffic Management Safety Center**

Mr. McClellan is the Freeway Operations Supervisor at MnDOT’s Regional Transportation Management Center (RTMC) in Roseville, MN. He has worked for the Department since 2002. Mr. McClellan’s group is responsible for monitoring 700 Metro freeway traffic cameras; locating incidents, deploying overhead signs, coordinating response with State Patrol and dispatching the Freeway Incident Response Safety Team (FIRST). He is a regular presenter to first responders on highway safety and emergency traffic control.

## **Intelligent Compaction & Machine Guided Excavation**

Presented by Rebecca Embacher

During this session there will be a discussion on why MnDOT is fully implementing both the intelligent compaction and paver mounted thermal profiling technologies by 2018. In Addition there will be a discussion on the effects that these technologies have on location survey tasks required prior to project start dates. An update will be provided on 3D production monitoring for excavation (machine guided excavation) and also on the increasing interest, by industry and asphalt paving contractors, for MnDOT to start providing incentives for the use of 3D milling and 3D profile paving (i.e., the discussions that have transpired and possible paving specification changes that would allow for this option).

### **Rebecca Embacher – Minnesota Department of Transportation**

Ms. Embacher, M.S., P.E., earned her M.S. in Civil Engineering at the University of Minnesota. She has worked as a research engineer at the University of Minnesota and Minnesota Department of Transportation, a pavement engineer at American Engineering and Testing, Inc., Assistant Grading and Base Engineer at the Minnesota Department of Transportation and is currently the Advanced Materials and Technology Engineer at the Minnesota Department of Transportation. Ms. Embacher's areas of experience are related to: the physical and mechanical properties of concrete, pavement design and preservation, seasonal load limits, research and development, earthwork/embankment and pavement construction, the implementation of geospatial technologies for evaluating paving and grading and base material properties prior to and during construction. This includes technologies such as, intelligent compaction on soil and bituminous applications, thermal profiling using infrared radar technology behind a paver, digital test/proof rolling, 3D production monitoring for muck excavation and more.

## **Land Corner Research (Rural Perspective)**

Presented by Robin Mathews

This presentation will provide insight into land survey records research and the determination of the location of land survey corners from a rural Minnesota perspective. The significance of historical land survey documents will be discussed. Methodology of land survey corner location will be analyzed. Examples of physical and record perpetuation of land survey corners will be presented.

### **Robin Mathews – Pine County Land Surveyor**

Mr. Mathews has worked in the land surveying discipline since 1987. He began his surveying career as a Cadastral Surveyor with the U. S. Department of the Interior, Bureau of Land Management. Mr. Mathews has worked in the private sector as a professional land surveyor for six years. He has performed boundary surveys in five Public Land Survey System states, in six non-Public Land Survey System states and in Washington, D.C. Mr. Mathews is a member of numerous professional land surveying organizations and has presented land surveying issues at state conferences. He was the 2015 President of the Minnesota Association of County Surveyors. Mr. Mathews is currently employed as the Pine County Land Surveyor and has been for the past eleven years. He is currently a Land Surveyor member of the MN Board of AELSLAGID and is licensed as a Professional Land Surveyor in Minnesota and Wisconsin.

## **Land Corner Research (Urban Perspective)**

Presented by Bill Brown

This presentation will provide insight into land survey records research and the determination of the location of land survey corners from an urban Minnesota perspective. The significance of historical land survey documents will be discussed. Methodology of land survey corner location will be analyzed. Examples of physical and record perpetuation of land survey corners will be presented.

### **Bill Brown – Retired Hennepin County Surveyor**

Mr. Brown's interest in land surveying began in 1969 as a student at the University of Minnesota School of Forestry. Following military service in the U.S. Navy, and further training at Saint Paul College in 1976 he worked actively for 23 years as a technician and licensed surveyor for private land surveying firms in the Minneapolis and Saint Paul Metro area. In 1999 Mr. Brown was hired by Hennepin County as Deputy County Surveyor then appointed as County Surveyor in 2002 where he served until his retirement in 2013.

Throughout his career Mr. Brown was an active member of the Minnesota Society of Professional Surveyors, the Minnesota Association of County Surveyors, the Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geo-science and Interior Design the National Council of Examiners for Engineers and Surveyors, the Metro GIS Coordinating Committee and the Technology Advisory Committee for MNSCU.

## **Leica Captivate Part 1 & 2 (a 2 hr. session)**

Presented by Tim Kerr

Experience the future of surveying by immersing yourself in the industry's only touch-technology software, test-driving the world's first self-learning total station and bringing live-streamed intelligent cloud-based imagery into the field. You will do things you never thought possible.

### **Leica Captivate Part 1:**

This session provides a description of the technological advances in the Leica Viva and Nova field instruments. Emphasis is placed on how these provide precise results in the most productive manner.

### **Leica Captivate Part 2:**

This session is a continuation of the Leica Captivate Part 1 with emphasis on the software aspects of these innovative systems. Topics discussed highlight both application and visualization of data in both the office and field.

### **Tim Kerr, Senior Support Engineer – Geomatics, Leica Geosystems Inc.**

Tim Kerr has been directly involved in the surveying and mapping industry since 1970. He was awarded a B.S. in Surveying from Ferris State University in 1981 and an M.S. in Geodesy from Purdue University in 1984. He was licensed as a surveyor in the State of Michigan in 1983. Tim's career with Leica Geosystems Inc. (Wild Heerbrugg Instruments at the time) began in February of 1985. During his time with the company he has served in many capacities which partially include support, training, sales and product development. He took leave from the company from 1993 until 2001 and served as one of the principals of a company providing training and project management services for users of modern surveying technologies.



## **Loon Satellite Tracking**

Presented by Carol Henderson

During this session you will learn of the research currently underway on Minnesota loons involving satellite transmitters, geolocators, migration, and petroleum pollutants from the Deepwater Horizon oil spill. This project is funded by a grant from the Environment and Natural Resources Trust Fund and by the Nongame Wildlife Program. Cooperators include the US Geological Survey, University of Connecticut, and the Wisconsin Department of Natural Resources.

### **Carol Henderson – Minnesota Department of Natural Resources**

Mr. Henderson has been supervisor of the Minnesota Department of Natural Resources-Nongame Wildlife Program since 1977. He has a B.S. in zoology from Iowa State University (1968) and a Master of Forest Resources degree in ecology from the University of Georgia (1970).

In 1977 Mr. Henderson was hired to create and develop Minnesota's new Nongame Wildlife Program for the Department of Natural Resources. He has continued in that role to the present and has developed a comprehensive program for the development and protection of Minnesota's nongame and endangered wildlife species. During the past 43 years Mr. Henderson has developed a statewide program for the conservation of nongame wildlife that has received both national and international recognition. He has helped plan and carry out restoration of peregrine falcons, bald eagles, eastern bluebirds, river otters and trumpeter swans in Minnesota.

Mr. Henderson is the author of 13 books including Woodworking for Wildlife, Landscaping for Wildlife, Wild About Birds: the DNR Bird Feeding Guide, and the Field Guide to the Wildlife of Costa Rica. The Traveler's Guide to Wildlife in Minnesota and Lakescaping for Wildlife and Water Quality. Other books include Oology and Ralph's Talking Eggs, Birds in Flight: The Art and Science of How Birds Fly, three field guides on wildlife of Costa Rica, and last May, Feeding Wild Birds in America: Culture, Commerce, and Conservation.

## **Machine Control Modeling & Today's Construction Staking**

Presented by Jeremy Erickson (*Biographical Reference Creating a 3D Corridor Utilizing Geopak and Trimble Business Center*) & Kyle Klasen

The following topics will be addressed during this session:

- The value of using machine control on construction projects
- Generating machine control models using plan and electronic data
- How to deal with discrepancies between plan data and electronic data
- What is required for construction staking on machine control project
- The importance of construction staking specifications and special provisions
- Open discussion on project specific experiences on machine control projects

### **Kyle Klasen – WSB and Associates**

Mr. Klasen is a Survey Group Manager for WSB and Associates and has been working for WSB for 10 years. He is a licensed Land Surveyor in North Dakota, Iowa and Minnesota. Mr. Klasen worked for the Minnesota Department of Transportation for 15 years in District 3B, St. Cloud. His professional background has focused on transportation projects from initial design surveys through construction staking.

## **MnDOT Geodetic & Photogrammetric Survey Products**

Presented by Mar Alojado, Colin Lee & Bernard Obwocha

The Geodetic portion of this session will cover different mapping software particularly the Geodetic Viewer to view control marks and how to extract survey information especially datasheets using utility tools and applications. Learn some tips and tricks!

The Photogrammetric section of this presentation will cover the new image server and the Photogrammetric section will now be serving its imagery products via WMS and ArcGIS Server. This new service will be replacing our existing method of imagery distribution (CD/DVD) with an online resource. In this short demo, you'll learn what the service is and how to bring it into MircoStation/PowerGeoPak or ArcMap.

### **Mar Alojado – Minnesota Department of Transportation**

Mr. Alojado is a Senior Land Surveyor who has been working in the Geodetic Unit of MnDOT's Office of Land Management for 18 years. He has worked in other offices in the Department and MN DNR for a total of over 38 years! Mr. Alojado graduated with a B.S. Degree in Geodetic Engineering in the Philippines. He was licensed to practice surveying there for over 3 years with the Bureau of Lands and the Farms System Development Corporation before immigrating to the United States in late 1976.

### **Colin Lee – Minnesota Department of Transportation**

Mr. Lee is a Certified Photogrammetrist at the Minnesota Department of Transportation. He received his undergraduate degree in geography from the University of Minnesota – Twin Cities. In his 10 years with MnDOT, Mr. Lee has worked with various types of remotely sensed data.

### **Benard Obwocha – Minnesota Department of Transportation**

Mr. Obwocha is a Senior Land Surveyor at MnDOT working in the office of Land management, Geodetic Unit. He has worked for MnDOT for 10 years. He was part of the Graduate Engineer/Land Surveyor program for two years. Benard graduated from St. Cloud State University with a B.S. in Land Surveying. He is originally from Kenya and had worked for a private company as a Land Surveyor for three years there.

## **Mobile LiDAR Case Study**

Presented by Nathan Anderson & Adam Smith

This presentation will provide an overview of five high precision mobile LiDAR projects that were controlled to achieve maximum vertical accuracy. Discover the intricacies of how these projects were controlled; learn about the collection\processing of Mobile LiDAR data and the accuracy that was achieved.

### **Nathan Anderson – Minnesota Department of Transportation**

Mr. Anderson is a Senior Land Surveyor with MnDOT's Office of Land Management Geodetic Unit and has earned a BS in Land Surveying and Mapping Science from St. Cloud State University. He administers the Statewide Continuously Operating Reference System/Real Time Reference Network Global Navigation Satellite System (CORS/RTRN GNSS) activities associated with the operation of the existing and future network, so that all internal and external users' needs are met. Mr. Anderson processes, analyzes and perpetuates CORS station data for submittal to the NGS, MnDOT District Survey Offices, Geodetic database, and other interested parties throughout the nation. He also coordinates,

conducts and promotes all aspects of the network for inclusion into the NGS National Spatial Reference System (NSRS). His professional activities include memberships in MSPS and NSPS.

#### **Adam Smith – Minnesota Department of Transportation**

Mr. Smith is a certified photogrammetrist and project manager for The Office of Land Management's Photogrammetric Unit. He has worked for MnDOT more than 15 years and has spent the last 12 working in photogrammetry. Mr. Smith holds a Bachelor of Science Degree in Conservation and GIS from the University of Wisconsin at River Falls and a Master of Science Degree in Infrastructure Systems Engineering from the University of Minnesota.

#### **Mobile LiDAR for Multiple Applications: Drive Once Read Many**

Presented by Craig Gooding

Mobile LiDAR projects have historically been focused on particular project or type of data. This leads to multiple data collection passes over the same roads. A recent project for the Minnesota DOT on I-694 took a different approach, capturing data at an accuracy and scope to allow extraction of information for a variety of requirements.

#### **Craig Gooding – Continental Mapping**

Mr. Gooding has been involved in geospatial data and applications for government and commercial use for nearly 30 years. Starting as a rod-and-chain man for a regional gas utility during college, he has been a successful project manager on a land information data contract for the Bureau of Land Management, U.S. Department of the Interior, has helped develop trucking-specific databases for navigation and permitting, and since November, 2015 has been the senior account manager for transportation at Continental Mapping Consultants. Mr. Gooding has a B.S. in Forestry from Michigan Technological University.

#### **Point Cloud Deliverables From Photogrammetry & Imaging**

Presented by Steve Richter

New or not so new surveying techniques are well under way and they are now taking center stage. With new technological advances, measuring from photos is putting a whole new light on how to accomplish some traditional surveying tasks. In this session we will look at the Vision technology of measuring from photo's. This highly accurate, safe and productive technology is offered in many different platforms. We will look at traditional Total Station photo measurements, new Digital Camera photo measurement, Mobile Imaging Technology, as well as Unmanned Aircraft Systems (UAS) photo measurement technology. We will also focus on creating Point Cloud deliverables from these measurement techniques.

#### **Steve Richter – Frontier Precision, Inc.**

Mr. Richter is the Vice President of Sales for Frontier Precision, Inc. A charter member of the Trimble MGIS Hall of Fame and Trimble Certified Trainer, Mr. Richter started his career in the surveying profession back in 1989, working with CAD products and services while he attended college. Getting into GPS technology in 1991, he has spent the last 25 years specializing in that discipline. With the past 15 years focusing on training and support, Mr. Richter has been able to provide certified training to Engineering, Surveying and MGIS professionals throughout the Upper Midwest as well as provide technology driven lectures

on GPS and Surveying. He currently resides in Minnesota working out of the St. Cloud Minnesota office for Frontier Precision.

### **Point Clouds: Bring Laser Scanned Data Into Civil 3D**

Presented by Scott Mizzsak

Laser scanners have become a common tool for surveyors to collect ground data, but what do you do with all of the data that it collects? This session will walk the users through the process of taking data out of the scanner and into Autodesk Recap where the scans will get registered and scan data is cleaned up. From there the user will take the refined data into Civil 3D. Within Civil 3D we will look at the options for creating a surface from the scans and then the ability to generate line work from common planes of data.

#### **Scott Mizzsak – CAD Technology Center**

Mr. Mizzsak has been working as a Civil Application Engineer for CAD Technology Center, an Autodesk Platinum Partner in the Midwest since 2011. He has experience working with Civil Engineering, Surveying and Construction firms, providing them with training and support. He specializes in AutoCAD Map 3D, InRoads and Civil 3D and is currently a certified WisDOT Civil 3D Trainer. With the practical experience as a survey crew chief, he has valuable ability to apply the tools of the software to the real life issues that companies will face on a daily basis. Mr. Mizzsak, a past speaker of Autodesk University, MnDOT Survey Technical Workshops, IDDEA, MNGIS Consortium, Minnesota Civil 3D User Group and CAD America, has worked with Autodesk products since AutoCAD Release 13. He has a Geography GIS Degree from the University of Minnesota and was NSPS Level III construction certified when he worked as a Survey Crew Chief.  
[scottm@cadtechnologycenter.com](mailto:scottm@cadtechnologycenter.com)

### **Professional Ethics: A Facilitated Discussion**

Presented by Rick Morey (*Biographical Reference: Welcome & Opening Remarks*)

During this session we will explore the relationship between the law, morality and ethics, with a focus on professional ethics for surveyors. Included will be a look at ethical conflicts, particularly the ones faced by those practicing surveying, including how they impact the unlicensed technician. Several situations will be presented for small group discussion and audience participation is encouraged and expected.

### **Retro-Reflecting Prism Errors**

Presented by David Zenk

Robotic (self-aiming) total stations force surveyors to take a fresh look at the errors that can occur if prisms are not used correctly. Even traditional total stations require surveyors to understand the potential error sources inherent in retro-reflecting prisms. This presentation will show these sources, their magnitudes and propose best practices for surveyors to consider in prism selection and use.

#### **David Zenk – National Geodetic Survey**

David Zenk is a Geodesist with the National Geodetic Survey, serving as Regional Geodetic Advisor for the Northern Plains Region (MN, ND, SD, IA, NE). He holds Bachelor of Science Degrees in Civil Engineering and Mechanical Engineering from the University of Minnesota and a Master's Degree in Land Surveying from Oregon State University. He has served as adjunct faculty at the University of Minnesota Geography Department and at Saint Cloud

State University Geography Department. He is a past Chair of the Minnesota GIS/LIS Consortium. He is currently serving as Editor of the MSPS "Minnesota Surveyor" magazine. Mr. Zenk is licensed as a Registered Land Surveyor and Professional Engineer in the State of Minnesota.

### **See Tracks, Think Train!**

Presented by Sheryl Cummings

Making safe decisions around tracks and trains is something that affects nearly each and every one of us. While there are always more enforcement and engineering measures being put in place to help keep people safe around the tracks, the reality is that more than half of the incidents at highway-rail grade crossings occur at crossings equipped with active warning devices such as flashing lights or gates. Keeping yourself safe when behind the wheel or on foot requires patience, ignoring distractions, and adhering to traffic control devices, but keeping yourself safe while on the job requires even more of your attention.

During this session we will go over the answers to questions like:

- Does a train always have the right of way?
- If you are working near railroad tracks do you know which railroad controls the tracks and have emergency numbers for them? If not, do you know how to obtain this information?
- If a train is blocking an intersection you must use, what do you do?
- What do you do if the equipment you are driving stalls or gets hung up on the tracks?
- How do you go about safely stopping a train in an emergency?

In addition to information and safety tips we can provide resources to help you spread the rail safety message in your company and community.

### **Sheryl Cummings – Minnesota Operation Lifesaver**

Ms. Cummings is the Executive Director of Minnesota Operation Lifesaver, Inc. a statewide nonprofit organization affiliated with Operation Lifesaver, Inc. a national rail safety nonprofit. Their mission is to reduce collisions, deaths, and injuries at highway-rail grade crossings and on railroad property. The organization trains and coordinates volunteers across the state that are authorized to provide free presentations to both public and professional audiences about how to make safer decisions around tracks and trains. Their mission is to raise awareness in an effort to prevent tragedies on and around railroad tracks. Last year they reached nearly 40,000 people through their presentations and community events in addition to millions reached through their other awareness efforts.

Ms. Cummings joined Minnesota Operation Lifesaver, Inc. in 2013. She holds both a Bachelor's Degree from Moorhead State University and a Master's Degree from the University of Minnesota – Duluth.

### **St. Croix River Crossing Project**

Presented by Michael Beer

During this session you will learn about the history, design and construction of the new extradosed bridge crossing the St. Croix River near Stillwater, Minnesota. When finished, this new bridge will take over the duties of the historic Stillwater lift bridge built in the early 1930's.

### **Michael Beer – Minnesota Department of Transportation**

Mr. Beer received his Bachelor's and Master's Degrees in Civil Engineering from the University of Minnesota. His employment includes two years with Caltrans (California Department of Transportation) in Project Management and Construction as a Resident Engineer and eighteen years with MnDOT (Minnesota Department of Transportation) in Materials and Construction. Mr. Beer is currently the Assistant District Engineer for Construction overseeing the Construction, Materials and Surveys operations in the Metro District and the Project Director of the St. Croix Crossing project.

### **Surveying the Cannon Valley Trail**

Presented by Dale Lemke

The Cannon Valley Trail is a 20 mile stretch of former railroad property between Cannon Falls and Red Wing, Minnesota and is one of the premiere paved trails in the state with annual usage of almost 100,000 people. This session will cover the challenges of surveying the trail, which is now owned by Goodhue County and is administered by a nine member Joint Powers Board consisting of citizens, Cannon Falls, Red Wing and Goodhue County elected officials. The presentation will identify a variety of survey topics including legal descriptions, plat layout, survey records research, alignment computations and data collection techniques. There will also be a brief demo of a mobile-friendly application utilizing the Esri ArcGIS Online WebApp Builder application platform that gives trail users information about the trail.

### **Dale Lempke – Goodhue County**

Mr. Lempke has been a licensed Land Surveyor in Minnesota since 2012. He has been employed with Goodhue County since 2011 as a Deputy Surveyor and was employed with MnDOT from 2008 to 2011 in various surveying assignments. In his current position he also provides surveying services to Dodge County. Prior to becoming a land surveyor, Mr. Lempke held engineering management positions with IBM, Western Digital and JDS Uniphase. He has a Bachelor's Degree in Land Surveying from St. Cloud State University and a Bachelor's Degree in Mechanical Engineering from the University of Wisconsin-Madison.

### **The Evolution of the 5TH PM Grid System (1815-2016)**

Presented by Don Borcharding

In 1815 the Government Land Office began the survey of the Missouri Territory for Land Grants to pay the soldiers after the war of 1812. Deputy Surveyors Joseph C. Brown and Prospect Robins began the survey of the 5th Principal Meridian which became the largest Land Survey Base in the United States. Who were these two men and how was the Initial Point Established? Over the next 100 years the Meridian was extended north 168 Townships through six states? How were the survey procedures refined as they projected the grid? What were some of the difficulties encountered? Learn this and more during this session.

### **Don Borcharding – Licensed Professional Engineer and Surveyor in MN & IA**

Mr. Borcharding is a licensed Professional Engineer and Surveyor in Minnesota and Iowa. He is a graduate of Iowa State University, retired as President of Yaggy Colby Associates, Past President of the Minnesota Society of Professional Surveyors, Emeritus Member of the State Professional Licensure Board and past adjunct professor at St. Cloud State University in the Land Surveying Program. He has received Professional Awards as both Surveyor and

Engineer of the Year. Mr. Borcharding has spent over 40 years researching Surveying History and gives frequent talks on early explorers including Lewis & Clark, Zebulon Pike, Stephen Long and Andrew Talcott.

### **The Rectangular Public Land Surveys in MN**

Presented by Rod Squires

This session will provide a context for the rectangular land surveys in Minnesota. There will be a description of the surveying process that not only created the corners and lines comprising the rectangular grid but also the records used by modern land surveyors.

#### **Rod Squires – University of Minnesota**

Mr. Squires is an Associate Professor in the Department of Geography, Environment and Society at the University of Minnesota. He is the author of over 50 articles on the rectangular land surveys in Minnesota.

### **TopoDOT for Transportation Corridor Topography Extraction from Mobile LiDAR Data**

Presented by Ted Knaak

During this session there will be a demonstration of TopoDOT software applied to mobile LiDAR data from a major highway corridor project. Tools and workflows for management of data, quality assessment and extraction of high quality CAD topography and 3D models will be demonstrated.

#### **Ted Knaak – Certainty 3D LLC**

Mr. Knaak has over twenty years of experience in the LiDAR industry. Early in his career, Mr. Knaak was a control systems analyst for GE Space Systems from 1983 through 1990. In 1990 he joined Schwartz Electro Optics in Orlando, FL where he was introduced to LiDAR. In 1993, Mr. Knaak and Dr. Johannes Riegl of Riegl Austria founded Riegl USA, a company focused on the promotion and application of the Riegl LiDAR technology product line in North America. Since 2005, Mr. Knaak and his team have developed TopoDOT, a LiDAR data processing application. In 2011, his current company, Certainty 3D LLC, was spun off as a completely independent company focusing on LiDAR data processing solutions and the improvement of process productivity. Mr. Knaak holds Master of Science Degrees in Electrical and Mechanical Engineering from Brown and Drexel Universities.

### **TopoDOT GIS Asset ID & Extraction from LiDAR Data**

Presented by Ted Knaak (*Biography Reference: TopoDOT for Transportation Corridor Topography Extraction from Mobile LiDAR Data*)

During this presentation there will be a demonstration of automated software tools for the identification, location and extraction of GIS assets from mobile LiDAR data. TopoDOT newest tools offer automatic point cloud classification of high probability GIS assets eliminating the need for tedious search through data. Workflow from point cloud import to ArcGIS export will be demonstrated.



## **Traffic Safety: Working in the Right of Way**

Presented by Kathleen Schaefer

This session will cover how to work safely in right of way including: how to use the 2014 Temporary Traffic Control Field Manual, how to determine the correct layout to use for lane/shoulder closures, what signs and devices are needed and where the devices should be placed.

Mr. Schaefer has been the circuit trainer with the Minnesota LTAP since 2002, prior to that she was a maintenance worker with the Minnesota Department of Transportation. As circuit trainer, she conducts a wide variety of classes to city, county and state maintenance workers across the state.

Those classes include:

- snow and ice material application
- snowplow sander calibration
- gravel road maintenance and dust control
- vegetation management and erosion and sediment control
- workzone traffic control and flagger training

## **Tree Identification Topic: “Original” Bearing and Line Trees**

Presented by David Hanson

You work your way to a section corner and begin attempting to locate nearby bearing trees. What might those trees look like today? Will those trees be spectacular giants or declining, broken shells of their former selves? While this presentation cannot cover all possibilities – we’ll look at decay resistance and longevity of Minnesota species in addition to how trees age. Finishing the discussion with a look at 5 common genera used as “original” bearing trees in Minnesota.

### **Dave Hanson – Minnesota Department of Transportation**

Mr. Hanson works in MnDOT’s Office of Environmental Stewardship. He completed a Bachelor of Science Degree, from the University of Minnesota, in Assessment and Modeling of Natural Resources followed by a Master’s Degree focusing on Urban and Community Forestry. As an ISA Certified Arborist and Urban Forester at the University of Minnesota, Mr. Hanson taught plant identification skills to ISA Certified Arborists, Master Gardeners, Municipal Employees and anyone else listening, including CCM crews and a classroom full of dendrology students. Now, as a Vegetation Management Specialist with MnDOT, he still teaches identification and management skills while honing his own skills daily – on questions from every corner of Minnesota.

## **Trimble Tablet Functionality**

Presented by Jay Haskamp and Wes Schneider (*Biographical Reference An Insider’s Look at COGO & Functions Within Trimble Access*)

In this session you will discover how the Trimble Tablet gives users more productive tools in the field. Learn how to load background maps, Graphical Stakeout, Surfaces, Split Screen with Trimble Access, as well as other advanced functionality will be covered. Tablet markups, layer management and other new items will also be covered during this session. Lastly, we will demonstrate how this bigger screen footprint allows for 3D Map functions.

### **Jay Haskamp – Frontier Precision, Inc.**

Mr. Haskamp is a Trimble Certified Trainer and an Applied Geospatial Engineer for Frontier Precision, Inc. He has been involved with Surveying and Engineering since 2002 and has served just about every role both in the field and the office. Mr. Haskamp joined Frontier Precision in 2008 and is their lead Certified Trainer for GNSS, robotic total stations, 3D laser scanning and Photogrammetry. He has had the opportunity to both survey with and train surveyors throughout the upper Midwest, the Rocky Mountain states, Alaska and Mexico.

### **Unmanned Aircraft System (UAS)**

Presented by Jay Haskamp (*Biographical Reference Trimble Tablet Functionality*)

In this session we will discuss the proper and legal use of UAS devices for survey applications. The discussion will be focusing on the steps needed to legally fly commercial UAS devices, requirements for flight, how to produce High Quality Ortho Photo's, Digital Terrain Models, and Point Clouds. We will discuss a safer, quicker and affordable application driven solution to these methods.

### **What Does It Take To Fly A Drone Commercially and Generate High Accuracy Deliverables**

Presented by Jeffrey J. Walsh and Steven N. Zeets

The recent developments in drone technology have sparked a lot of interest across many disciplines, and it has also been the driving force behind the development of new photogrammetry software, low-cost RTK GPS systems, and host of other miniaturized airborne sensors. In this presentation, we will cover the current Federal and State requirements for commercial drone operations, what it takes to be successful if you're interested in collecting your own imagery, and we'll go over several projects where we used drones commercially to create high-accuracy deliverables.

### **Jeffrey J. Walsh – Peregrine Aerospace**

Before founding Peregrine Aerospace in 2015, Mr. Walsh worked for an Engineering firm for 15 years on a wide array of projects, most of which required a combination of Photogrammetric and GIS workflows. He has completed many large International Airport projects around the U.S., which entail Electronic Airport Layout Plans (eALPs), and Airspace Obstruction Surveys. In recent years, Mr. Walsh has shifted his focus to developing complete sUAS systems designed to deliver high accuracy photogrammetric deliverables. Jeff has a Professional Masters in Geographic Information Science and Remote Sensing, is an ASPRS Certified Photogrammetrist, a GISP, has a 333 Exemption and is a Private Pilot.

### **Steven N. Zeets – Land Surveyor**

Mr. Zeets started his career as a survey rodman on a 3-man survey crew and is now a licensed land surveyor in Iowa. His 20+ years' experience in surveying, GIS, IT and photogrammetry led him to read about drones online in 2011. Mr. Zeets immediately started to acquire knowledge, parts and soldering skills to build his own multi-rotor and fixed wing systems. He started off repairing more than flying, but his skills advanced along with the technology. Mr. Zeets has a Section 333 exemption from the FAA and acquired his recreational pilot's license, both of which allow him to \*LEGALLY\* fly UAVs commercially. He has flown over 1,200 mapping missions and is currently working on finding value in the data that drones produce.

## **Wisconsin/Minnesota State Line**

Presented by Brian Meyer

Determining the exact location of the boundaries between states can be a challenge – especially those with water bodies serving as boundaries. One of the boundaries between Minnesota and Wisconsin was established as the main channel of the Mississippi River. Since that line was established nearly 168 years ago, the location of the state boundary has become clouded, creating difficulty and turmoil for entities that need to know exactly where that line is. In this session you will find out how the boundary between Minnesota and Wisconsin came to be, how it got "lost", situations where exact location was needed and how it might be clearly defined and established again.

### **Bryan Meyer – LaCrosse County Surveyor, Wisconsin**

Mr. Meyer, serves as La Crosse County (Wisconsin) Surveyor – a position he has held since 2008. He also serves as President of the Wisconsin County Surveyors Association (WCSA). Mr. Meyer has been involved in land surveying since 1976. He is a 1980 graduate of Nicolet Area Technical College in Rhinelander Wisconsin and was employed as a land surveyor in private practice for nearly thirty years. During his career, Mr. Meyer also served as a deputy County Surveyor and a part-time County Surveyor. Mr. Meyer's contact information is: phone: (608) 785-9626 email: [bmeyer@lacrossecounty.org](mailto:bmeyer@lacrossecounty.org)

## **FINAL THOUGHTS & CLOSING**

Presented by Bryan Dodds (*Biographical Reference: Welcome & Opening Remarks*)

# **Vendors And Exhibits**

## **BENTLEY SYSTEMS, INC.**

Bentley Systems is a global leader in providing architects, engineers, geospatial professionals, constructors, and owner-operators with comprehensive software solutions for advancing the design, construction, and operations of infrastructure. Bentley users leverage information mobility across disciplines and throughout the infrastructure lifecycle to deliver better-performing projects and assets. Bentley solutions encompass MicroStation applications for *information modeling*, *ProjectWise* collaboration services to deliver integrated *projects*, and *AssetWise* operations services to achieve *intelligent infrastructure* – complemented by worldwide professional services and comprehensive managed services. Website: [www.bentley.com](http://www.bentley.com)

## **CTC**

CTC is leading the building and infrastructure industry in the adoption of dynamic BIM technology for both industries. As one of the largest Autodesk Platinum Partners in the United States, CTC provides complete Autodesk software implementation plans, professional design services and custom software development that solves the unique needs of each organization. CTC's customer approach begins with understanding current processes and workflows, then build upon the firm's success with suggestions specific to their work group. We're a true partner who goes above and beyond in all that we do. When you are ready for a true partnership with an Autodesk reseller who is passionate about BIM

and customer service, let CTC provide the expertise for your team. For more information on how you can work with CTC, please visit [www.cadtechnologycenter.com](http://www.cadtechnologycenter.com)

### **CARLSON SOFTWARE**

Founded in 1983 and headquartered in Maysville, KY, Carlson Software specializes in CAD design software, field data collection, and machine control products for the land surveying, civil engineering, construction, and mining industries worldwide, providing one-source technology solutions from data collection to design to construction. For more information, please contact **Ladd Nelson**, Sales Director – Midwest Region Carlson Software at 563-583-8552.

### **CERTAINTY 3D**

Certainty 3D, LLC is located in Orlando, FL specializing in LiDAR (laser scanning) data processing solutions. Certainty 3D's primary product is TopoDOT®, a high performance MicroStation® application designed to Manage data, Assess quality and Extract 3D models to feed downstream design, engineering and construction processes. Certainty 3D's newest product, TopoCloud™, provides LiDAR data management and storage capabilities. Two freeware web applications, TopoPlanner™ and TopoMission™ help users plan, schedule and estimate costs for laser scanning field operations. For more information, please contact Ted Knaak, 7039 Grand National Drive #100, Orlando FL 32819 or call him at 407-248-0160 [Ted.knaak@certainty3d.com](mailto:Ted.knaak@certainty3d.com).

### **FRONTIER PRECISION/TRIMBLE, INC.**

Frontier Precision has been a leading supplier of high quality Survey, Mapping, GIS, and Construction equipment and supplies since 1989, a Trimble Dealer since 1991. With offices in 7 Midwestern States, Frontier has become one of Trimble's largest volume dealers, most recently being awarded the Top Geospatial Trimble Dealer in the World for 2015. Frontier boasts 4 Trimble Certified Service Centers, with 4 Trimble Certified trainers. With one of the most experienced teams in the country, Frontier Precision brings more expertise to the market and the most technologically advanced solutions than anyone in the area. Frontier proudly represents Trimble, Spectra Precision, Nikon, Seco, and Pacific Crest. For more information, please contact Frontier Precision at [www.frontierprecision.com](http://www.frontierprecision.com) or 1-800-944-8557. Also, check out our Survey Blog for valuable "how to's," tips and tricks, and events calendar at [www.fpisurvey.com](http://www.fpisurvey.com).

### **HISTORICAL SURVEYORS**

At this display you will have an opportunity to view some antique survey equipment, literature and relics. It is a great way to learn about the past and gain an understanding of what "walking in their footsteps" means.

The Historical Surveys collection stems from the interest David Claypool and Lisa Hanni have in the instruments and measuring methods used by earlier surveyors. On display are tools Surveyors have used in the field for data collection and measurement, drafting and calculating tools used in the office to produce maps, and recovered artifacts. These items range from the 1800's through the 1980's. Together with Fred Johnson, they have put together a hands-on traveling educational display which is shown at various venues

throughout the year. Several people have donated equipment and artifacts that continue to enhance the collection.

### **LEICA GEOSYSTEMS, INC.**

Leica Geosystems is best known for its broad array of products that capture accurately, model quickly, analyze easily and visualize and present spatial information.

[www.leica-geosystems.com](http://www.leica-geosystems.com). Please contact Chris Rotegard at 612-385-6067 or email him at [chris.rotegard@leicaus.com](mailto:chris.rotegard@leicaus.com) for more information.

### **MARTINEZ GEOSPATIAL**

Founded in 1974 by former MnDOT employee Tony Martinez, Martinez Geospatial is a family-owned firm located in Eagan, Minnesota, providing Photogrammetry & Orthophotography, Land Surveying, High-Definition Laser Scanning, Mobile Mapping, Spatial Modeling, Graphics & Visualization, and Aviation Consulting services. Martinez Geospatial executes aerial and mobile mapping services for approximately ten (10) highway and aviation projects directly for MnDOT annually, and several more as a subconsultant. Martinez Geospatial is PreQualified in Work Types 10.1, 10.21, 10.22, and 10.24, and is certified as a Disadvantaged Business Enterprise (DBE) by the Minnesota Unified Certification Program (MnUCP) and as a Minority Business Enterprise (MBE) and Small Business Enterprise (SBE) by the Central Certification Program (CERT). For more information, please contact **Martinez Geospatial, Inc.**, 2915 Waters Road, Suite 100, Eagan, MN 55121. Phone: 651-686-8424 Fax: 651-686-8389 Email: [martinez@mtzgeo.com](mailto:martinez@mtzgeo.com) Web: [www.mtzgeo.com](http://www.mtzgeo.com)

### **MINNESOTA DEPARTMENT OF TRANS. GEODETIC UNIT**

MnDOT's Geodetic staff will be available to discuss and demonstrate the different products and services available to access and manage geodetic data. MnCORS staff will also be on hand to describe the current network/server configuration that supports the system and to answer questions regarding issues users may be experiencing. We welcome and encourage any suggestions or comments you may have regarding ways to improve.

### **MINNESOTA OPERATION LIFESAVER, Inc.**

Minnesota Operation Lifesaver, Inc is a statewide nonprofit whose mission is to reduce collisions, deaths, and injuries at highway-rail grade crossings and on railroad property. Our efforts to raise awareness and provide free education to the public through our nation-wide network of trained, authorized and dedicated volunteer presenters has helped to bring the collision rate between vehicles and trains down by over 80% over the past 4 decades. The fact remains however, that about every 3 hours a person or vehicle is hit by a train and more than half of the collisions that occur at highway-rail grade crossings occur at crossings equipped with active warning devices, so more and continued education is still needed. More information on how to make safer decisions around tracks and trains for all types of audiences including professional drivers, teachers, commuters, and even photographers can be found at <http://oli.org>

### **MOSHER THOMAS INDUSTRIES, LLC**

Mosher Thomas Industries, LLC is a company formed in April, 2015 by two helicopter pilots. We are 100% legal to fly for commercial gain with UAVs in the National Airspace System.

We have obtained our 333 exemption from the FAA and we are fully licensed and insured. MTI is based out of Central Minnesota, but has accomplished work as far away as North Carolina. We currently service the industries of aggregate, agriculture, surveying and aerial/video photography.

### **NATIONAL GEOGRAPHIC SURVEY (NGS)**

NGS will exhibit information on products and services available. Stop by and speak with NGS representatives and your Northern Plains Regional Advisor, David Zenk. Get answers to your geodetic questions.

### **TRUCK UTILITIES, INC.**

Truck Utilities, Inc. was founded in 1963 and is a 53 Year Old family owned and operated company. Principals of the company are Craig Capeder, Paul Capeder and Jay Langer. The headquarters of the company is located in St. Paul, MN with branches in Fargo, North Dakota and Kansas City, Kansas. We are a distributor for a wide variety of premiere truck mounted equipment.

Truck Utilities offers a large variety of crane types and styles in addition to service bodies made out of steel, stainless steel, aluminum or fiberglass. Standard or custom body styles can be adapted to meet your work requirements supported by computer-aided drawings. Department of Transportation personnel have relied on our expertise to satisfy the most demanding survey, traffic and maintenance crews.

Truck Utilities employs craftsmen specializing in chassis modifications and custom metal fabrication (steel or aluminum). We also offer hydraulic repair of truck circuits and hydraulic tools, road service, body repair and custom painting of your equipment up to 60 feet long.

We are the Stanley Hydraulic Tool Distributor for Minnesota and North Dakota and stock Post Drivers, Post Pullers, Earth Augers, Core Drills, Drills, Impact Wrenches and Power Units for every survey and traffic crew in any environment. These tools can run on standard or biodegradable oils. Ask us about our Datum Point Cutter for aluminum Monument Markers (patent pending).

A complete listing of the manufacturers we represent may be found on our website at [www.truckutilities.com](http://www.truckutilities.com). Please speak with Bernie Bourasa at the Truck Utilities display or contact him at [bernieb@truckutilities.com](mailto:bernieb@truckutilities.com) or by phone at 651-260-1340.

### **WISCONSIN HEIGHT MODERNIZATION PROGRAM**

After twenty years in the making, the Wisconsin Height Modernization Program has realized its goal of completing two independent geodetic control networks. The passive network is a fixed framework of 3D reference points on the earth's surface. WISCORS is the active network, providing reliable corrections to users in the field. Used together, sub-centimeter horizontal and vertical positioning can be achieved in real-time anywhere across the state.

## **MEAL MENUS DURING WORKSHOP**

### **Tuesday, March 15:**

Lunch: "Sandwich Buffet"

Dinner: "Traditional Buffet" (Sliced Turkey & Sliced Ham)

### **Wednesday, March 16:**

Breakfast: "Buffet Style"

Lunch: "Mexican Buffet" (Tacos)

Dinner: "Chef's Buffet" (Chicken Champagne & Beef)

### **Thursday, March 17:**

Breakfast: "Buffet Style"

***Meals & Breaks will be served in the Lakeside Dining Room  
except Thurs., 10am break will be in the Centre!***



## ***Peter W. Blethen, L.S. Memorial Scholarship***

*Sponsored by the Minnesota Society of Professional Surveyors (MSPS) and funded through the Minnesota Land Surveyors Foundation (MLS).*



The surveying community lost a longtime friend in Peter W. Blethen. Peter passed away on Friday, January 22, 2016, following a courageous battle with cancer. Peter Blethen was a graduate of the University of Colorado, Boulder and a dedicated employee of Bolton & Menk, Inc. for over 31 years until his retirement in 2014. He was a Registered Land Surveyor in both Minnesota and Iowa. Peter worked very hard in advancing survey technology within Bolton & Menk as well as in the surveying industry. Throughout Peter's career, he supported the MLS (Minnesota Land Surveyors) Foundation's efforts. Peter believed there was no better way to promote the surveying profession than to support the surveying students in their educational pursuits.

In 2002, he was the first owner of the prestigious MSPS Traveling Bearing Tree Trophy. During his career, Peter was appointed the Nicollet County Surveyor in 1992 and continued to serve in that capacity until 2014. Peter was an active member of the Minnesota Society of Professional Surveyors, serving in multiple capacities including Chapter Secretary, Chapter Vice President and Chapter President. He served on the MSPS State Board as Secretary for 1 year, Director for 2 years and was the State President in 2003. In 2006, Peter was recognized for his contributions to the land surveying profession in Minnesota by being awarded the MSPS Surveyor of the Year Award. Peter served on the South Central College Civil Engineering Technology Advisory Committee.

Peter was a member of the MnDOT Survey Technical Workshop Committee from 2005 to 2013. His contributions to the workshop were invaluable and appreciated over the years. We honor his memory.

If you would like to contribute to the Blethen Memorial Scholarship, please contact and send checks and/or correspondence to:

***MLS Foundation***

c/o Dennis J. Purcell, PLS  
1399 Wood Duck Trail  
Shakopee, MN 55379-9430  
[dpurcell20@hotmail.com](mailto:dpurcell20@hotmail.com)

Make Checks Payable to: MLS Foundation – Please note the Blethen Memorial Scholarship. The Minnesota Land Surveyors Foundation is a 501 (c) (3), non-profit corporation. A tax deduction receipt will be provided to the donor.

## ***WEBSITE ADDRESSES FOR YOUR INFORMATION***

Minnesota Department of Transportation, Office of Land Management –

<http://www.dot.state.mn.us/landmanagement/>

MnDOT's Geodetic Unit –

<http://www.dot.state.mn.us/surveying/geodetics/index.html>

MnDOT Right of Way Mapping –

<http://www.dot.state.mn.us/surveying/mapping.html>

MnDOT CORS/VRS Network –

<http://mncors.dot.state.mn.us/Map/SensorMap.aspx>

MnDOT Right of Way & Survey Workshops & Training

<http://www.dot.state.mn.us/landmanagement/calendar.html>

MnDOT Survey Tools & Technology

<http://www.dot.state.mn.us/surveying/toolstech/index.html>

MnDOT Photogrammetrics –

<http://www.dot.state.mn.us/surveying/photogrammetrics.html>

National Geodetic Survey – <http://www.ngs.noaa.gov/>

US Coast Guard Navigation Center – <http://www.navcen.uscg.gov/>

The Minnesota Secretary of State – <http://www.sos.state.mn.us/>

Minnesota Association of County Surveyors – <http://www.macsinfo.us/>

Minnesota Society of Professional Surveyors – <http://www.mnsurveyor.com/>

The Minnesota State Legislature – <http://www.leg.state.mn.us/>

National Highway Institute – <http://www.nhi.fhwa.dot.gov/default.aspx>

International Right Of Way Association – <https://www.irwaonline.org/eweb/StartPage.aspx>

Federal Highway Administration – <http://www.fhwa.dot.gov/>



# **WORKSHOP NOTES**